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5th Teaching Biennale 2017

Abstract

Improving conceptual understanding by inductive teaching: an example of its success

Maarten Nauta, DTU Food

Introduction

We are teaching a PhD/MSc course on quantitative microbiological risk assessment with up to 20 students with a varying (international) background and two teachers. We have experienced a challenge in explaining one of the key concepts in the theory. It requires that the students adopt a way of thinking about the concepts variability and uncertainty that requires deeper understanding, and accommodation rather than assimilation of new knowledge is required. I therefore decided to change the teaching method, without impacting the rest of the course too much, as it is mainly successful as it is. I choose to try the use of an inductive instead of a deductive approach, based on Kolb's learning cycle (experience, reflection, conceptualization, practice). The performance of the students after application of the inductive approach was compared with the performance with the old approach.

Method

In the old deductive approach, we (1) explained the theory; (2) gave an exercise (X) during the lecture that no student has ever been able to do correctly and (3) gave an example of the application of the theory. In the new inductive approach this sequence was changed to (1) do exercise X as pretest, (2) give a guided exercise that aims to guide the students through the challenges step by step, so they can develop the conceptual thinking themselves, (3) explanation of theory, (4) give a new guided step by step exercise, (5) do exercise X again. In the old approach, evaluation at examination didn't show the deeper understanding that we were after. It was assessed whether this was better with the inductive approach.

Results

It showed that, with the inductive approach, the student also had problems with (2) the guided exercise: they are not able to do it correctly, so it was not sufficient to let them develop the deeper understanding themselves. However, when they got a new guided exercise (4) after a lecture (3), it showed most students now understood the theory and were able to perform well. 50% of the students were now able to solve exercise X, whereas none of them was able to do it in the pretest. This showed that the students learned during the process.

Discussion

It is shown that the new inductive teaching approach improved the effectivity of the teaching. Even though the new concept didn't get through during the first guided exercise (experience), it seems this exercise prepared the students for understanding during the lecture (reflection), so they were able to conceptualize and perform well during the practice (second guided exercise and exercise X).

This teaching experience shows that an inductive approach can facilitate learning. Still, it is not necessarily the inductive approach that did the trick, it can also be the new guided exercise itself. Also, there is still a large group of students that still have problems with the conceptualization, so more efforts may be needed. One of the major challenges is how to find the right balance between student guidance and self-discovery: in principle learning is facilitated by self-discovery of the challenge and

the solution to the challenge, but as a teacher you have to guide the students in this process without giving away too much.

Group discussions

After the presentation of my experience, we will have discussions in small groups, where we share experience in trying to teach key concepts to students and make them accommodate new knowledge. Have we experienced that? What do we do if that doesn't work? Can we advise each other?

Reference

Kolb, David A. (2015) [1984]. *Experiential learning: experience as the source of learning and development* (2nd ed.). Upper Saddle River, NJ: Pearson Education. ISBN 9780133892406.